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CROYDON CONGRESS, 1879.

# GEOLOGY

IN RELATION TO

## SANITARY SCIENCE.

BY

ALFRED HAVILAND.

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## Geology in relation to Sanitary Science.

By ALFRED HAVILAND.

It is a charming and recreative amusement, especially to the much-worked mind, to speculate on what in future ages may obtain among men in regard to their health, physical and mental strength and beauty, and their length of days. The vision of fair women and strong men living without disfiguring decay until twice three-score years have revolved with them in their journey through life, is like a pleasant dream; and like all pleasant dreams, gives evidence of a healthy parentage—unlike the morbid imaginings of an oppressed mind, labouring under a load of crude and indigestible ideas. This vision has the merit of so impinging upon our minds, as to make us reflect and earnestly consider, whether the scene presented to our mental vision, clothed as it is with apparent reality, if not a reality now, can ever become a possibility. There is nothing unnatural either in the figures or their proportions in this fair vision of man's future earthly life. It contains no ghostly monsters to affright, no so-called superior beings, with plumed anatomical impossibilities, to be wondered at with humiliation: no phosphorescent halos distinguish the good, no sulphur fumes betray the presence of the bad. The men, the women, and their attendant brutes, are unendowed with anatomical impossibilities. If we have learned the anatomy of the vertebrate of to-day, we shall be able to demonstrate that of the denizen of the dream, whenever that dream is realized. We presume the dreamer does not wish us to imagine that the men will be more perfect in their strong beauty than the Greek athletes, who stood as models before Pheidias, or the women more lovely than those whose lines of voluptuous beauty ravished the sculptor of the Venus de Medici. So far, then, we have nothing but what nature has already supplied, and we may reasonably expect to see the like again. Man, too, has been known to live beyond the six score and five years of the people of the dream. Man has lived, and in many instances still lives on the produce of the vegetable kingdom, without shedding the blood of his fellow-creatures. Moreover, there is nothing in his present surroundings in some few favoured parts of the world that will preclude his being as beautiful, as strong, as perfect in health and as long-lived, as he is known from the records of credible history to have been. He may still live only on the fruits of the earth. He may still live in communities governed by natural laws—his average mortality may be reduced to what is now a theoretical minimum—and under these conditions he must *multiply*. A hundred men and women starting



in pairs at the time when their bodies have just completed their developmental life—which at the latest may be attained at twenty-five years—would, before each pair had arrived at the age when the reproductive powers wane, have increased to at least six-fold; and as death would neither weed out the little ones, nor excess the elders, we may expect a prodigious increase in this healthy and long-lived community.

Now it must be patent to all that, after a few generations, the vast increasing concourse must migrate either westward or eastward, northward or southward; far away from the first fertile and climatically perfect spot which first attracted their ancestors—perchance from the rich red sandstone soil, with its fertile corn-bearing and fruit-producing vales and sloping hills, well watered, well wooded, well drained, to an adjoining coal-bearing land, where the bleak and barren mountains of millstone grit rear their craggy outline above inhospitable mosses and infertile uplands—where the mineral riches beneath the barren soil await the labour of a race, whose antecedents have not taught them to endure. Foreed from the paradise of their father's selection by their loyal desire to obey the most imperative of their father's laws, "Thou shalt not overcrowd thy father's house"—they bid farewell to their happy homes and cease to be what once they were. They stand face to face with the stern reality of change; a change so great they cannot realize it. At first their little ones begin to droop—the parents' hearts sicken at their new grief, and the strong stalwart man, depressed and careworn, seeks with willing hands but with misgiving heart to conquer rugged nature, and force from her the necessary food for those who follow him. The scene is changed—the dream is over—the pleasant vision, like a baseless fabric, has been swept away. Help is called for; and Science, like a good genius, extends her hand. The dreamer and the dream are gone. Large as our world may be, it never has been, and we have no grounds for believing it ever will be, a universal paradise: and without it becomes so, the people of the dream can never become realities.

The records of the rocks teach us each day how, through countless ages, our earth's crust has changed—how what once was the bottom of the sea has formed the loftiest mountains, and how again these snow-capped and ice-seared rocks have had the stable ocean rushing in strong currents hundreds of fathoms above them—and how again, like our own hills, these mountain heights have again emerged capped with tender shells and weeds, the denizens of the deep. Whilst the records of the rocks teach us this, wherever they have been searched, we find not a single writing in the stones that records evidence of either uniform climate, uniform soil, or uniform conditions of any kind whatever, conducing to the perfection of existence either among the lower or the higher classes of animals.

The very factor so necessary to the perfection of type, viz., health, is the great factor of productiveness; and this productiveness is the factor of destruction by over crowding. Over and over

again has this been recorded on the rocks. Without reason, the lower creatures are unable to modify the conditions of life; with reason, man makes the attempt and often succeeds, his first efforts being almost invariably directed towards modifying by his labour the site which he has selected for his home, either from choice or force of circumstances. He tills, he seeks for water, he selects sites for his cattle—in fact, he sets to work to obtain a knowledge of the ground on which he stands; for by degrees he has learnt how conducive to his health and happiness a practical knowledge is of the earthy crust, from which his food springs, his water is drawn, and on which his habitation rests.

Passing from the dream to the realities, which nature has engraved upon the countless strata-folios of her records, stereotyped in her huge rock volume, whose massive pages envelope the molten centre of our globe, and what do we find?

Records of change on change—records of vast floral and faunal dynasties, each of which has endured for innumerable ages longer than the oldest dynasties of Egypt or of China, and yet we have evidence that nature has allowed, in her infinite wisdom, each to be overthrown—each to become extinct—and give place to a more perfect form. Has this hitherto ceaseless revolution done its work—outspent its force? Will the first dawn of intellect, whose temple is the brain of man, blaze into perfect brilliance during the very first human dynasty on which the great centre of our solar system has ever shone? Will the sweet healthy beauty of nature's queens, the manly symmetry of her kings, so exquisite and perfect to our finite sight, ever remain, for countless ages to come, the crowning product of nature's handiwork?

Does the history of their predecessors warrant us in holding such a belief? True it is that man, unlike his humbler predecessors, has, through his inherent and novel gift of intellect, so cultured his surroundings, so educated his mind, as apparently to have improved his body form and with it the material source of that mind, which differentiates him from his companion brutes.

Apparently, I say; for is it certain that during the twice two-thousand years of which we have the records of his dynasty, that he has so improved in mind and body? Are our women and men more beautiful in body, more gifted with mental power, than the Ayrians of old, from whose loins sprang the models of Pheidias?—the poet who sang in Sanskrit and in Greek, or their contemporary orators, historians, mathematicians, architects, sculptors and painters? In my own humble opinion, a negative reply must be given to this momentous question. Another question yet, and I will then bid farewell to the dream of my honoured friend, who has so charmed us with his narrative. Whilst men have still preserved their manly and intellectual strength; whilst women still are to be found that would delight the eye of the most exacting sculptor of the ancient Greek school, do we not see around us more degraded human forms than the world has ever known, not



only absolutely but relatively? And do we not find these declensions from the normal standard more abundant among the civilized than the naturally barbarous and uncivilized?

And if so, why is it? Is it not because we have fallen short in our pursuit of the necessary knowledge of how to live. We have gone on living and breeding in limited areas; we have confined ourselves to favoured spots, and have spoiled them.

Man has not only spoiled many of the sites which his ancestors wisely selected as vantage grounds against the foe, the flood, and the drought; but is hourly spoiling his own form by his artificial habits, and laying at the same time the foundation for a still further departure from a natural standard in his offspring. He is polluting the soil on which his habitations stand, he is befouling his water-courses and springs, and he is poisoning the air he breathes. He has thus created surroundings from which he can with difficulty escape; and not content with the natural disease-poisons with which the fens, the tropical lagoons and deltas of the great rivers abound he creates around his own and neighbour's dwelling the conditions that will produce newer and specific forms of disease which disfigure, disable, and kill those nearest and dearest to him.

Man has indeed made his own haunts the haunts of fevers and very magazines of organic poisons; so that the soil, which might have been a perennial source of wealth and health, has become one of disease and death.

It is humiliating to find that branches of science which have been studied for more than two thousand five hundred years should have advanced so little towards the amelioration of the evils with which man is naturally and artificially surrounded. I have said that man has spoiled many of the fair sites on which he has pitched his tent. Also that he has spoiled himself. I have hinted that there are some places which, without man's interference have been the sources of disease.

Hippocrates, who lived between two and three thousand years ago, was a physician, and the founder of medicine. He was in advance of the age in which he lived, and in many things in advance of that in which we live. This extraordinary man lived at a time when there were as his contemporaries some of the most brilliant men the Greek Islands ever produced. He taught at that remote period how necessary it was to study the nature of the soil in relation to disease, the qualities of the waters which either sprang from it or has flowed over it. He laid down certain rules, which are applicable now to the same locality wherein he practised, as to the selection of sites, &c.; and he wrote a philosophical treatise on airs, places, and waters, which may be read now with advantage, and especially by those who think there is nothing like the learning of the nineteenth century; for they will there see clearly and distinctly shown that diseases have a geographical distribution, and that the soil on which man lives must be studied by the physician who would wish to combat successfully with disease.

The graphic description of the effect of the swampy country



around the River Phasis on the dwellers there shows how keenly he observed and how highly he appreciated the facts which nature pointed out to him on the bosom of mother earth.

Hippocrates well knew that whilst the crust of the earth remained as it was in his day, whilst there were deltas, swamps, and lagoons exposed to the heat of the sun, that disease would arise; and that unless these spots were pointed out by the physicians, men would heedlessly settle there, and in the sequel pay the heavy penalty of ignorance which we are doing every day. All this knowledge had been gathered, digested, and sent forth in the most choice language that man could write centuries before the Christian era; and yet we are, in our boasted nineteenth century, piling up statistics, binding them in blue covers, placing them on our shelves, and converting these volumes that contain them into simple dust collectors. I say that this is humiliating, and certainly does not encourage us in believing that the efforts which Sanitary Institutions are making now will be followed by the anticipated success; at least in this country.

When we sum up our knowledge—I mean that modicum which we have gathered during the last century—and compare it with the gigantic mass collected, digested, and published for the public good by one man long before the Christian era, we shall be startled at its pigmy proportions. This is a time for a great tirade against some of the stupid things that man has invented. We hear of soil pipes, ventilating shafts, and every possible contrivance to keep the sewer gases out of our houses; in doing all this we are only correcting a gross blunder which the boasted intelligence of the nineteenth century committed. We poison our water, and then contrive something to prevent its being done in the future, and think how clever we are; and when we have done one or two things of this kind, we show our friends our houses, give them the name of the engineer or the architect who has rectified, as he thinks, the blunder of a former engineer or architect; we placidly fold our hands, look up contentedly to the sky, think what a wonderful thing we have done—and congratulate ourselves on a chance of living all the days of our life. I maintain that blunderingly altering the blunders of others is not Sanitary Science.

Now I hold that any Institute established for the purpose of teaching us the science of living in a cleanly and wholesome manner—as regards water, air, and soil—should first of all teach in its schools what has already been taught by such men as I have mentioned, as a wholesome restraint against the pride which a little knowledge engenders. Before we can boast of any Sanitary Science, let us be able to point to our researches on the climates, the soils, the diseases, we find at home and abroad in our vast colonies. Let the crust of the earth in various parts of the globe be thoroughly examined in its relation to diseases—recollecting that, had not man been born there are certain spots in this earth that produce certain specific poisons, the chemical constitution of which

we know nothing. Such spots should be mapped, after having been thoroughly investigated as to soil and climate, for the use of emigrants, colonists, and those in command of our expensive but necessary soldiery—I say necessary, for whilst we have barbarous and uncivilized nations to contend with, like the Russian and Zulu, soldiers will be a necessity; and directly the word soldier is named, what a history of murderous blunders arise to appal us!

For want of studying the geology and climate of the stations to which we have consigned and still continue to consign these expensive but most necessary members of society, how many valuable lives have been sacrificed, how much treasure squandered!

How many times have we sent and shall continue to send our troops to encamp upon the dried-up beds of rivers which, as Sir Ranald Martin has said are the deadliest of sites.

How often are we to be taken aback by fever breaking out on such a rock as Gibraltar? When will the conductivity of our soils as regards heat be studied? I have said that man spoils the site which he has selected to live on. Let us only look at that map of distribution of Fever in England and Wales, and know that wherever you see the districts coloured blue in different shades, there are to be found the polluted soils which man has converted into so many beds of disease. You have only to study the geology in connection with these blue groups, and you will soon see the cause.



